

- Group 15 - Tests and Adjustments
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Section 260 - STEERING AND BRAKES

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Section 270 - HYDRAULIC SYSTEM

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Section 290 - OPERATOR'S CAB

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Section 299 - SPECIAL TOOLS

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- Group 10 - Special Tools (Available as Spare Parts)

BCU 002003.09- Incorrect CAN BUS Message, Information from EPC/PRC

06

This diagnostic trouble code is generated when a data transfer problem occurs between the BCU and EPC or PRC. Reception of one, several or all of the CAN messages transmitted by the EPC or PRC is intermittent or non-existent (intermittent reception could be due to a loose wire).

→NOTE:

This diagnostic trouble code may be generated when the tractor is shut off at an engine speed above 1500 rpm. In this case, BCU, EPC and PRC control units cannot power down immediately. The following diagnostic trouble codes may also be generated: BCU002000.09, BCU002003.09, EPC002000.09, EPC000190.08, EPC002033.09, PRC002000.09 and PRC002033.09.

Diagnostic procedure**(1) Verify diagnostic trouble code****Action:**

This diagnostic trouble code may be generated when the tractor is shut off at an engine speed above 1500 rpm. Removing fuse F05/08 ensures that the diagnostic trouble code is not generated by mistake.

1. Remove fuse F05/08.
2. Delete the diagnostic trouble codes and do an operational check on faulty component/function, or do a test drive. Thereafter refresh diagnostic trouble codes. For more information on how to process diagnostic trouble codes, see [Operation and General Information on Diagnostics - Accessing Addresses and Diagnostic Trouble Codes](#) in Section 245.

Result:

YES: The diagnostic trouble code has been generated again: [GO TO 2](#).

NO: The diagnostic trouble code is no longer generated; reinstall fuse F05/08. Diagnosis completed.

(2) Check the BCU fuses**Action:**

Check fuses F05/05 (ELX) and F05/03 (BAT).

For arrangement of fuse box (load center), see:

[F04 to F07 - Fuses \(Cab\)](#)

Result:

YES: [GO TO 3](#).

NO: Replace the fuse.

(3) Priority diagnostic trouble codes must be processed first**Action:**

Check whether there are additional diagnostic trouble codes that are related to this problem.

1. Diagnostic trouble code BCU 000639.12 takes priority.
2. EPC diagnostic trouble codes that are related to this problem.
3. Are there additional diagnostic trouble codes from other control units that relate to a problem with the transfer of CAN BUS messages at the **EPC** or **PRC** ?

ECU 000637.08- Crank Sensor Signal Input Missing

17

The ECU does not detect the crank sensor input.

For diagnostic procedure, see:

- ["000637.08 - Crank Sensor Signal Input Missing"](#) in the relevant CTM for ECU Level 16 for 2-Valve HPCR Engine.

Tractor-related information:

- For details of location and information on components, see ["B72 - Crankshaft Speed Sensor"](#) in Section 240, Group 115.
- For a summary of the layout of leads, see:
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\)"](#) in Section 240, Group SE23.
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\) \(Open Operator's Station\)"](#) in Section 240, Group SE23.
- For a summary of the wiring harnesses, see ["Component Information - Wiring Harnesses - Summary of References"](#) in Section 240, Group 110.

ECU 000637.10- Crank Sensor Input Pattern Error

17

The ECU detects an improper pattern on the crank sensor input.

For diagnostic procedure, see:

- ["000637.10 - Crank Sensor Input Pattern Error"](#) in the relevant CTM for ECU Level 16 for 2-Valve HPCR Engine.

Tractor-related information:

- For details of location and information on components, see ["B72 - Crankshaft Speed Sensor"](#) in Section 240, Group 115.
- For a summary of the layout of leads, see:
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\)"](#) in Section 240, Group SE23.
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\) \(Open Operator's Station\)"](#) in Section 240, Group SE23.
- For a summary of the wiring harnesses, see ["Component Information - Wiring Harnesses - Summary of References"](#) in Section 240, Group 110.

ECU 000651.02- Cylinder No.1 Electronic Injector Part Number Invalid

17

The ECU detects an injector with an incorrect part number was installed or calibrated on cylinder no.1.

For diagnostic procedure, see:

- ["000651.02 - Cylinder No.1 Electronic Injector Part Number Invalid"](#) in the relevant CTM for ECU Level 16 for 2-Valve HPCR Engine.

Tractor-related information:

- For details of location and information on components, see ["Y82 - Injection Valve for Cylinder 1 \(4-Cylinder Engine\)"](#) or ["Y86 - Injection Valve for Cylinder 1 \(6-Cylinder Engine\)"](#) in Section 240, Group 115.
- For a summary of the layout of leads, see:
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\)"](#) in Section 240, Group SE23.
 - ["Diagnostic Schematic, SE23 - Level 16 ECU \(Electronic Engine Control\) \(Open Operator's Station\)"](#) in Section 240, Group SE23.
- For a summary of the wiring harnesses, see ["Component Information - Wiring Harnesses - Summary of References"](#) in Section 240, Group 110.

ECU 000651.05- Cylinder No.1 Electronic Injector Circuit Open

17

The ECU detects an open in the cylinder no.1 electronic injector circuit.

For diagnostic procedure, see:

EPC 523969.11- S125-1 - Gear Selector Switch, Voltage Too High During Start-Up

19

The diagnostic trouble code is generated when the EPC control unit detects an activated gear selector switch (upshift or downshift) during the starting procedure.

Diagnostics

Alarm level: Information.

(1) Verify diagnostic trouble codes

Action:

→NOTE:

Delete the diagnostic trouble codes and do an operational check on faulty component/function, or do a test drive. Thereafter refresh diagnostic trouble codes.

For more information on how to process diagnostic trouble codes, see [“Operation and General Information on Diagnostics - Access the Addresses and Diagnostic Trouble Codes”](#) in Section 245, Group 05.

Result:

YES:Diagnostic trouble code is ACTIVE: [GO TO 2](#).

NO:The diagnostic trouble code is STORED: • Other active diagnostic trouble codes must be processed first. • If no other active diagnostic trouble codes exist and the code appears repeatedly during operational check: [GO TO 2](#).

(2) Check status of gear selector switch

Action:

- Range shift lever in "park" position.
- Ignition on.
- Access address [EPC008](#).
- Make sure that the information displayed at address EPC008 complies with the following:

Item	Measurement	Specification
EPC008: S125-1 - Gear selector switch, status	Upshift switch at shift lever (S125-1) not pressed:	XXXX0XXX
	Press the upshift switch at shift lever (S125-1) for more than 2 seconds:	XXXX1XXX
	Downshift switch at shift lever (S125-1) not pressed:	XXXXX0XX
	Press the downshift switch at shift lever (S125-1) for more than 2 seconds:	XXXXX1XX

Result:

YES: [GO TO 5](#).

NO: [GO TO 3](#).

(3) Check the component

Action:

Perform a visual inspection of gear selector switch (S125-1) and of the connectors associated with it:

1. Check fuse F04/09 (EPQT BAT).
2. Check for signs of damage or dirt.
3. Check the electrical connections for bad, loose, widened, slid-back or corroded contacts; also check the leads.

For details of location and information on components, see [“S125-1 - Gear Selector Switch”](#) in Section 240, Group 115.

Action:

Do a visual inspection of enable pressure sensor (S150) and of the connectors associated with it:

1. Check for signs of damage or dirt.
2. Check the electrical connections for bad, loose, widened, slid-back or corroded contacts; also check the leads.
3. Check if the switch is stuck in open position.

For details of location and information on components, see [“S150 - Enable Pressure Sensor”](#) in Section 240, Group 115.

Result:

YES: If there are no visible signs of damage, [GO TO 4](#).

NO: Repair component or contacts as required and perform “S150 - Enable Pressure Sensor, Operational Check” in Section 245, Group PRC.

(4) Check the circuit**Action:**

Perform [“S150 - Enable Pressure Sensor, Circuit/Harness Test”](#) in Section 240, Group SE26B.

Result:

YES: [GO TO 5](#).

NO: Repair as required and perform “S150 - Enable Pressure Sensor, Operational Check” in Section 245, Group PRC.

(5) Checks for faults that only occur intermittently**Action:**

Type of error indicates a loose contact:

- Check the plug connections. For a summary of the layout of leads, see [“Diagnostic Schematic, SE26B - PRC Control Unit \(Transmission Control with Electrically Actuated Power Reverser Transmission\)”](#) in Section 240, Group SE26B.
- For back-up, see also additional references for circuit checks: [“Test procedure in the event of occasional malfunctions in the PRC circuits \(PRC beep mode\)”](#) in Section 240, Group SE26B.

Result:

YES: • See [“General Information - Electrical System, Troubleshooting Unsolved Problems”](#) in Section 210, Group 10. • Check DTAC to find out whether there is any more information on this diagnostic trouble code.

NO: Repair as required and perform “S150 - Enable Pressure Sensor, Operational Check” in Section 245, Group PRC.

Preliminary Test on Shift Elements and Vehicle Clutch/Brake in Off-Load Condition (for EPC software version numbers 7.02 and higher)

Test for tractor equipped with an EPC software version number 7.02 and higher. See address EPC234 for software version number. *.6030.BIN datapoint - EPC_234*

IMPORTANT:

Perform the test only while the engine is running and range-shift (gear-shift) lever is in neutral.

General preparations:

- Start the engine.
- Move the range shift lever to neutral.
- Use the hand throttle to set engine speed to 1000 rpm. *.6030.BIN datapoint - ECU_Engine_speed*

[1] - Checking the shift elements and solenoid valves for 1st gear

- Engage 1st gear. *.6030.BIN datapoint - EPC - Transmission Current Gear*
- Test must be carried out with reverse drive lever in forward and reverse positions. Make sure that the information displayed at the addresses complies with the following specifications.

Checking the shift elements and solenoid valves for 1st gear

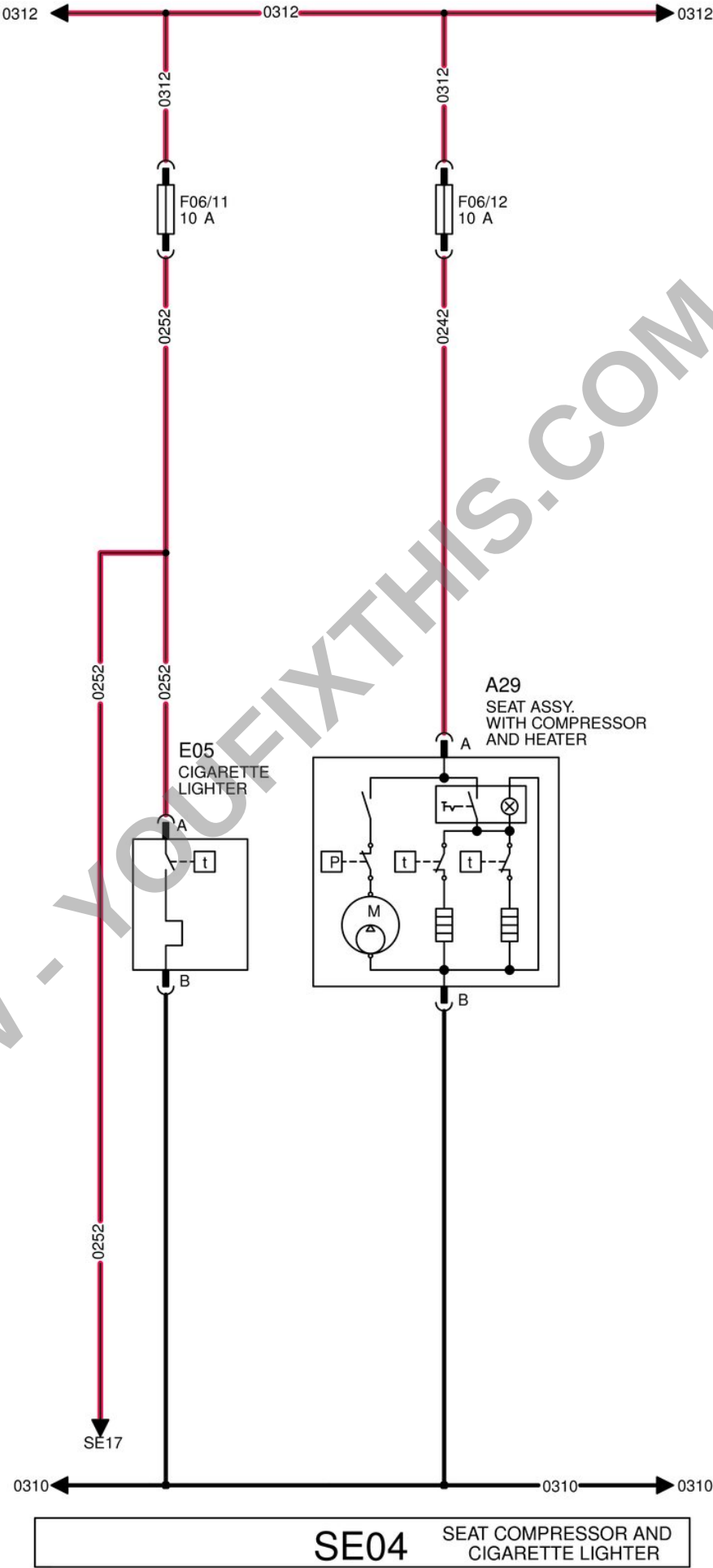
Checking the shift elements and solenoid valves for 1st gear		
CAN	CAN BUS message, engine speed	<i>.6030.BIN datapoint - ECU_Engine_speed</i>
EPC014	Transmission speed sensor, speed in rpm Reverse drive lever in forward position: approx. 566 rpm at an engine speed of 1000 rpm Reverse drive lever in reverse position: approx. 590 rpm at an engine speed of 1000 rpm	<i>.6030.BIN datapoint - EPC_014</i>
EPC061	Y40/Y39 - Current displayed in mA Valid amperage range with reverse drive lever in forward and reverse positions: 400 - 900 mA In first gear, both solenoid valves (Y39 and Y40) have to be activated. Display: XXXXYYYY X = amperage at solenoid valve Y40 Y = amperage at solenoid valve Y39 →NOTE: If 100 or 2000 mA is displayed at the address, this indicates an electrical fault in the circuit of the respective solenoid valve. 100 is displayed to indicate an open circuit and 2000 to indicate a shorted circuit.	<i>.6030.BIN datapoint - EPC_061</i>
EPC063	Y33/Y36 - Current displayed in mA Valid amperage range with reverse drive lever in forward and reverse positions: 400 - 900 mA Display with reverse drive lever in forward position: XXXX0000 Display with reverse drive lever in reverse position: 0000YYYY X = amperage at solenoid valve for forward travel (Y33). Y = amperage at solenoid valve for reverse travel (Y36). →NOTE: If 100 or 2000 mA is displayed at the address, this indicates an electrical fault in the circuit of the respective solenoid valve. 100 is displayed to indicate an open circuit and 2000 to indicate a shorted circuit.	<i>.6030.BIN datapoint - EPC_063</i>

[2] - Checking the shift elements and solenoid valves for 2nd gear

- Move the range shift lever to neutral.
- Engage 2nd gear. *.6030.BIN datapoint - EPC - Transmission Current Gear*
- Test must be carried out with reverse drive lever in forward and reverse positions. Make sure that the information displayed at the addresses complies with the following specifications.

Checking the shift elements and solenoid valves for 2nd gear

Checking the shift elements and solenoid valves for 2nd gear		
CAN	CAN BUS message, engine speed	<i>.6030.BIN datapoint - ECU_Engine_speed</i>
EPC014	Transmission speed sensor, speed in rpm Reverse drive lever in forward position: approx. 682 rpm at an engine speed of 1000 rpm Reverse drive lever in reverse position: approx. 711 rpm at an engine speed of 1000 rpm	<i>.6030.BIN datapoint - EPC_014</i>



LX1047571

S23 - Switch for Remote Control of Hitch (Right), Circuit/Harness Test

General information:

Switch S23 is located on the r.h. fender; it allows the hitch to be operated from outside the operator’s cab. All the signals from this switch are monitored and processed by the BCU.

For details of location and information on components, see [S23 - Switch for Remote Control of Hitch \(Right\)](#) in Section 240.

For operational check, see [S23 - Switch for Hitch Remote Control \(Right\)](#), Operational Check in Section 245.

Diagnostic schematic:

For a summary of the layout of leads, see:

- [Diagnostic Schematic, SE15 - BCU Control Unit \(Electronic Hitch Control\) \(Cab\)](#) in Section 240.
- [Diagnostic Schematic, SE15 - BCU Control Unit \(Electronic Hitch Control\) \(Open Operator’s Station\)](#) in Section 240.

Circuit/harness test

IMPORTANT:

When ignition is ON, disconnected plugs may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit/harness test has been completed.

(1) Check the harness in diagnostic mode

Action:

1.1 Check the switch for hitch remote control (right) (raising)

- Disconnect plug X34F (on harness W21) from the switch for hitch remote control (right) S23.
 - For details of location and information on components, see [X34F - Plug of Switch for Hitch Remote Control \(Right\)](#) in Section 240.
- Ignition ON.
- Access address [BCU113](#) and make sure that the display complies with the following specifications:

- Plug X34F disconnected:

Item	Measurement	Specification
BCU113: S23 - Switch for hitch remote control (right), status	with plug disconnected	000

- Pin C (lead 0050) bridged to pin A (lead 7041):

Item	Measurement	Specification
BCU113: S23 - Switch for hitch remote control (right), status	with pins bridged	001

- Pin C (lead 0050) bridged to pin B (lead 7044):

Item	Measurement	Specification
BCU113: S23 - Switch for hitch remote control (right), status	with pins bridged	010

Result:

YES: Harness is OK: GO TO **1.2** .

NO: [GO TO 2](#) .

Action:

1.2 Check the switch for remote control of hitch (right) (lowering)

- Access address [BCU115](#) and make sure that the display complies with the following specifications:
 - Plug X34F disconnected:

→NOTE:

For assistance with the circuit test, see the worksheet for circuit diagnostics in General Information - Electrical System, Worksheet for Circuit/Harness Test in Section 210.

Result:

YES: If there are diagnostic trouble codes that indicate a problem with the circuit: • Check the leads and connecting points for bad, widened, slid-back or corroded (**loose**) contacts. • Check DTAC to find out whether there is any more information on this diagnostic trouble code.

NO: Repair as required and do an operational check; see Y67 - Solenoid Valve for Raising (TLS), Operational Check in Section 245.

S114 - Park Lock Switch (PRC), Circuit/Harness Test

General information:

- “S114 - Park Lock Switch (PRC), Operational Check” in Section 245, Group PRC.
- For details of location and information on components, see “S114 - Park Lock Switch” in Section 240, Group 115.

Diagnostic schematic:

- For a summary of the circuit (layout of leads), see “Diagnostic Schematic, SE26B - PRC Control Unit (Transmission Control with Electrically Actuated PowrReverser Transmission)” in Section 240, Group SE26B.

Circuit/harness test

IMPORTANT:

When ignition is ON, disconnected plugs may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit/harness test has been completed.

(1) Check the wiring harness

Action:

- Disconnect plug X503M (on harness W21/3) from switch S114.
 - For details of location and information on components, see “X503M - Plug of Park Lock Switch” in Section 240, Group 105.
- Ignition ON.
- Access addressPRC005and make sure that the display complies with the following specifications:
 - Plug X503M disconnected:

Item	Measurement	Specification
PRC005: S114 - Park lock switch, status	Plug disconnected	XXX1 (Switch open)
◦ Pin B (lead 0050) bridged to pin A (lead 6021):		
Item	Measurement	Specification
PRC005: S114 - Park lock switch, status	with pins bridged	XXX0 (Switch closed)

Result:

YES:Harness is OK: [GO TO 3](#).

NO: [GO TO 2](#).

(2) Check ground

Action:

- Disconnect plug X503M (on harness W21/3) from switch S114.
 - For details of location and information on components, see “X503M - Plug of Park Lock Switch” in Section 240, Group 105.
- Use a [JT05791A](#) or [JDG1478](#) multimeter to check for continuity at the ground lead of plug X503M between pin B (ground lead 0050) and any defined ground connection:

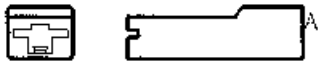
Item	Measurement	Specification
S114 - Park lock switch, ground	Ground	Continuity present

Result:

YES:Check signal lead 6021: [GO TO 4](#).

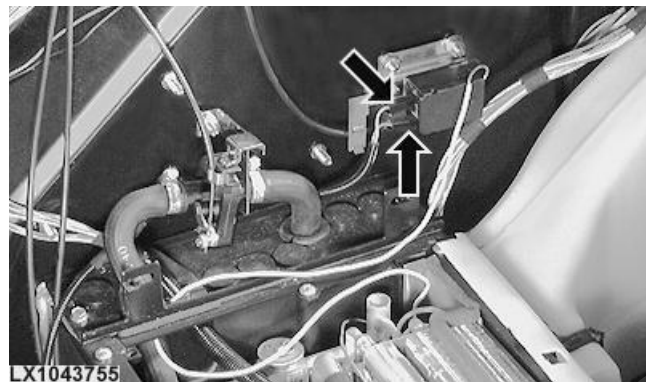
NO:Check ground lead 0050: [GO TO 4](#).

X73F - Connector of Thermostat Switch



LX1017945

X73F



X73F

Component information

Component information	
Number of pins:	2 x 1
Spare part number:	57M7170
Manufacturer / repair information:	AMP For repair information, see Section 40, Group 05 of the relevant repair manual.
Connection point:	Component B16, see Component Information - Electrical Parts/Components - Summary of References in Section 240, Group 115.
Wiring harness:	W90, see Component Information - Wiring Harnesses - Summary of References in Section 240, Group 110.
Circuit:	SE10 - Air Conditioning and Fan - Summary of References in Section 240, Group SE10.

Connector layout

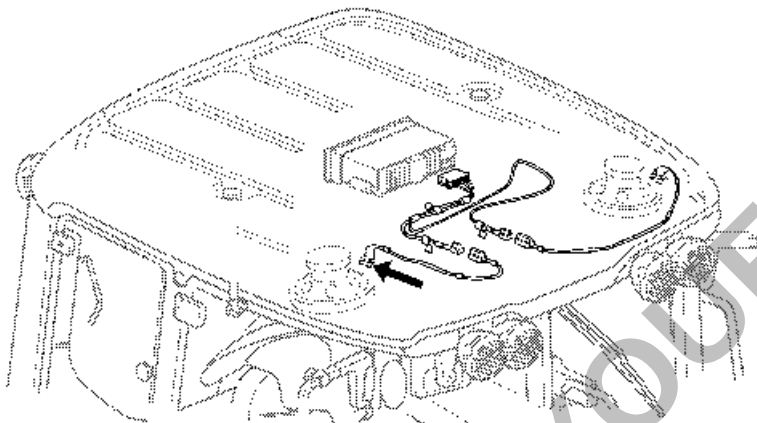
Connector layout		
Pin no.	Lead no.	Wire color
X73/1F	2071A	brown
X73/2F	2095AA	dark green

X284F-2 - Connector of Right Front Speaker



LX013182

X284F-2



LX1038977

X284F-2

Component information

Component information	
Number of pins:	1
Spare part number:	57M7112
Manufacturer / repair information:	Individual terminals For repair information, see Section 40, Group 05 of the relevant repair manual.
Connection point:	Component A06, see Component Information - Electrical Parts/Components - Summary of References in Section 240, Group 115.
Wiring harness:	W23, see Component Information - Wiring Harnesses - Summary of References in Section 240, Group 110.
Circuit:	SE09 - Radio, Dome Light and Console Light - Summary of References in Section 240, Group SE09.

Connector layout

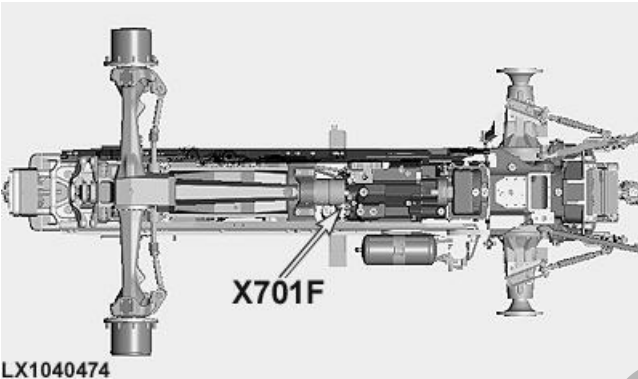
Connector layout		
Pin no.	Lead no.	Wire color
A	2081A	brown

X701F - Connector of Gear Selector Solenoid Valve K2



LX1017904

X701F



X701F

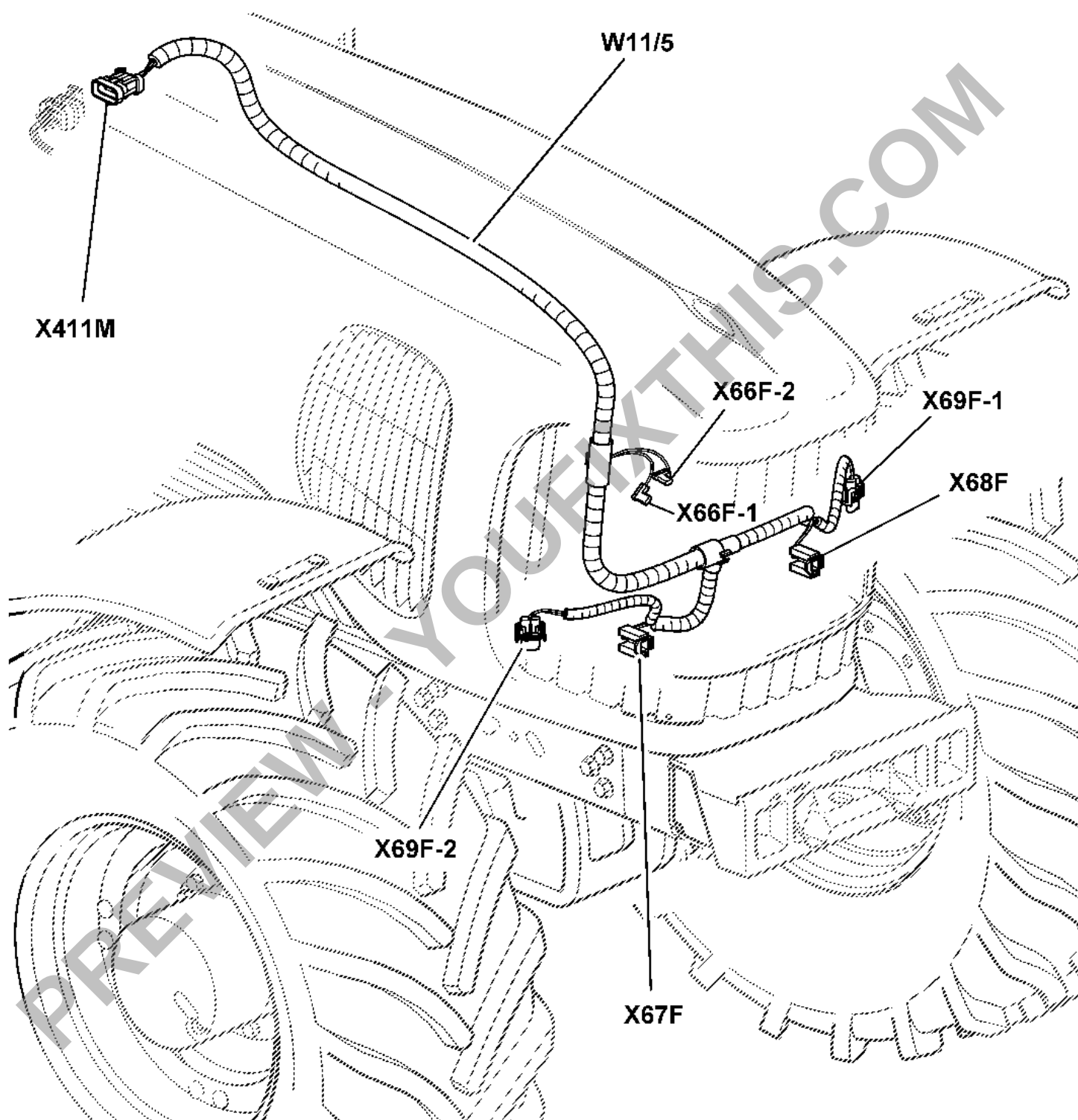
Component information

Component information	
Number of pins:	2
Spare part number:	57M7379
Manufacturer / repair information:	METRI PACK For repair information, see Section 40, Group 05 of the relevant repair manual.
Connection point:	Component Y39, see Component Information - Electrical Parts/Components, Summary of References in Section 240, Group 115.
Wiring harness:	W61, see Component Information - Wiring Harnesses - Summary of References in Section 240, Group 110.
Circuit:	SE26A - EPC Control Unit (Transmission Control with PowrQuad Plus Transmission) - Summary of References in Section 240, Group SE26A.

Connector layout

Connector layout		
Pin no.	Lead no.	Wire color
A	6043A	orange
B	0310AH	black

W11/5: Hood wiring harness



LX1043212

W11/5: Hood wiring harness

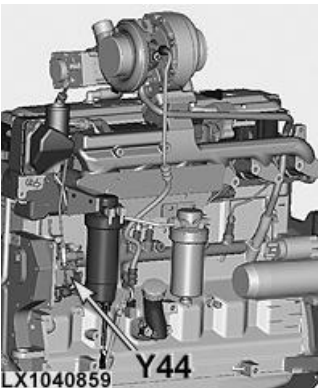
LEGEND:

X66F-1 X66F - Plug of Horn
X66F-2 X66F - Plug of Horn

Y44 - Suction Control Valve



Y44 - Suction Control Valve



Y44 - Suction Control Valve

Component information

Component information	
Type:	Solenoid valve
Location:	On the left side of the engine
Connector:	X566F - Connector of Suction Control Valve in Section 240, Group 105.
Wiring harness:	W51, see Component Information - Wiring Harnesses - Summary of References in Section 240, Group 110.
Circuit:	SE23 - Level 16 ECU Control Unit (Electronic Engine Control) for 2-Valve Engine with HPCR - Summary of References in Section 240, Group SE23.
Specifications:	Nominal voltage: 12 volts For more information, see: <ul style="list-style-type: none">• Component check
Components:	Compact component
Task:	Regulates the supply of fuel to the high-pressure pump

Component check

(1) Check suction control valve (Y44)

Action:

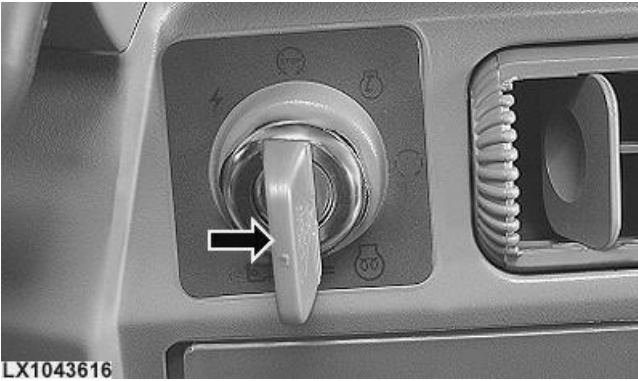
Perform a visual inspection of suction control valve (Y44) and of the connectors associated with it:

1. Check for signs of damage or dirt.
2. Check the electrical connections for bad, loose, widened, slid-back or corroded contacts; also check the leads.

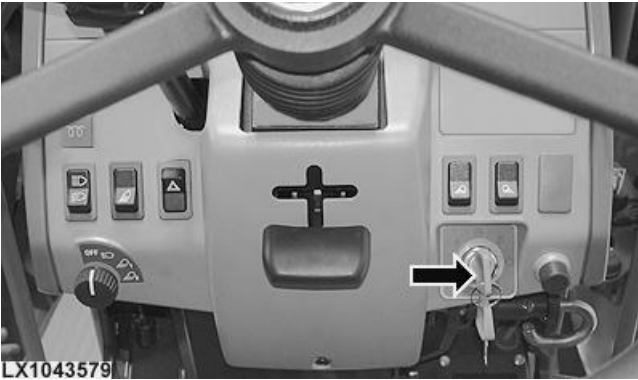
Result:

YES:Test completed

S01 - Main (Key) Switch



S01 - Main (Key) Switch (Cab)



S01 - Main (Key) Switch (Open Operator's Station)

Component information

Component information	
Type:	Switch
Location:	Right side of steering column
Connector:	S01F - Connector of Main (Key) Switch (Cab) in Section 240, Group 105. S01F - Connector of Main (Key) Switch (Open Operator's Station) in Section 240, Group 105. S01F-1 - Terminal for Main (Key) Switch (Cab) in Section 240, Group 105. S01F-1 - Terminal for Main (Key) Switch (Open Operator's Station) in Section 240, Group 105.
Wiring harness:	W22, see Component Information - Wiring Harnesses - Summary of References in Section 240, Group 110.
Circuit:	SE01 - Starting Motor and Charging Circuit - Summary of References in Section 240, Group SE01.
Specifications:	Nominal voltage: 14 volts Switched current: 40 amps max. Switched current in IGN position: 10 amps max. Switched current in ACC position: 15 amps max. Switched current in ELX position: 8 amps max. Switched current in ST position: 10 amps max. Switched current in AID position: 10 amps max. For more information, see: • Component check
Components:	Compact component
Task:	Switches voltage supply on and off.

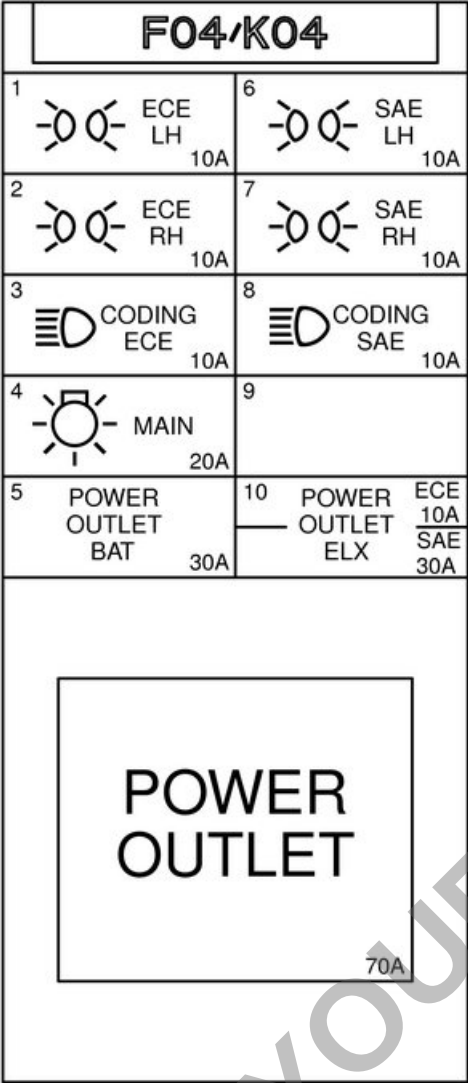
Component check

(1) Check the main (key) switch (S01)

Action:

Perform a visual inspection of the main (key) switch (S01) and of the connectors associated with it:

1. Check for signs of damage or dirt.
2. Check the electrical connections for bad, loose, widened, slid-back or corroded contacts; also check the leads.



LX1043774

K04 - Relays (Open Operator's Station)

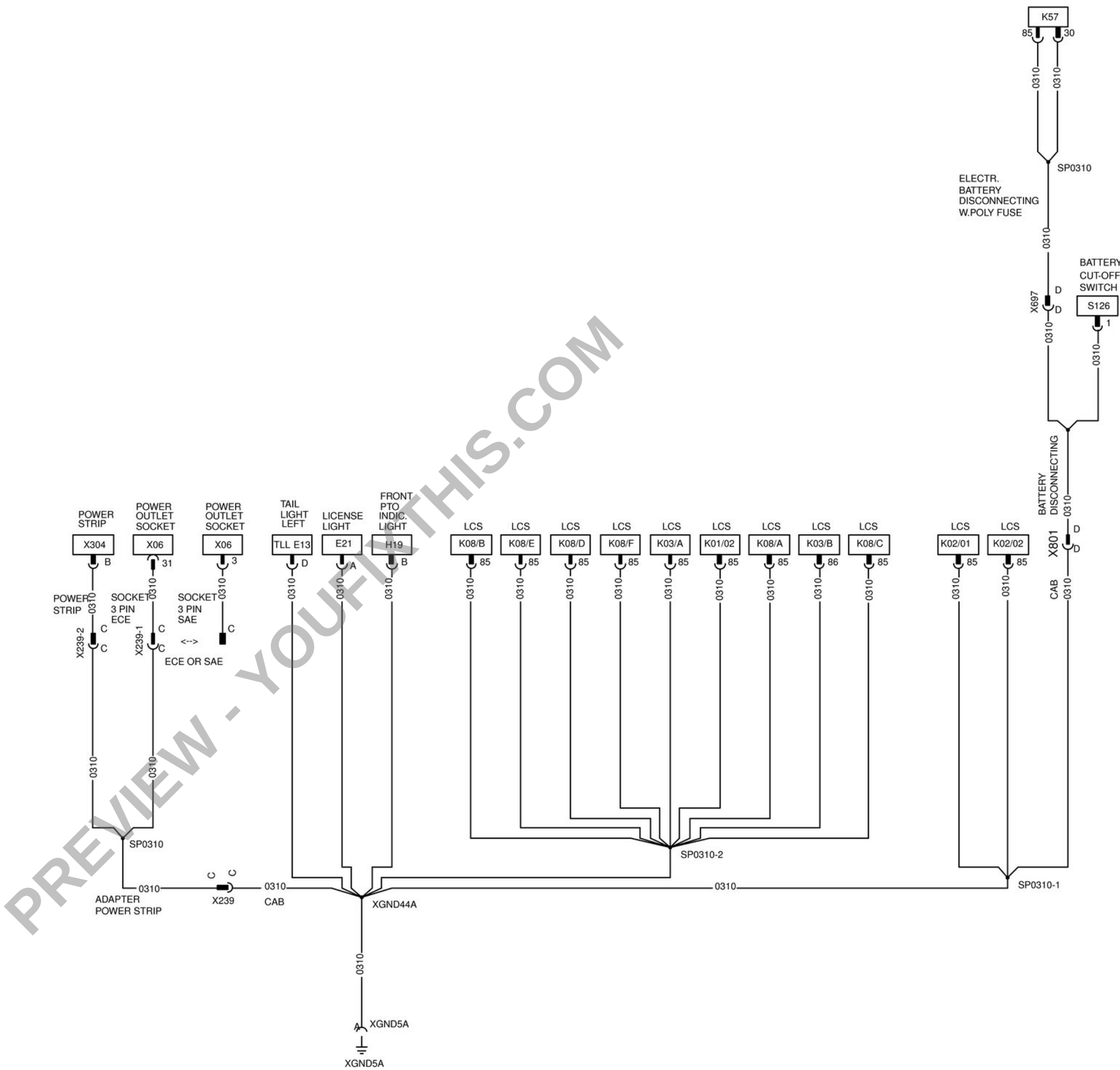
K04 - Relays (Open Operator's Station)

K04 - Relays (Open Operator's Station)

Relay no.	Rating (amps)	Designation	Section	Circuit
K04/1	70 A	Relay for 3-terminal socket, power outlet strip, 7-terminal socket (SAE) Relay for 3-terminal socket, power outlet strip (ECE)	SE14A SE14B	BAT BAT

XGND5A (Cab) up to Serial Number Break 2009

See [Serial Number Break 2009](#).



LX1044219

XGND5A (Cab) up to Serial Number Break 2009

Address BCU089 - Vacant Input Address

Vacant input address

BCU089	Vacant input address	6030.BIN datapoint - BCU_089
Factory setting:	0001	

If necessary, change the value *6030.BIN datapoint - BCU_089* .

Address BCU090 - Input Address Not used

Input Address Not Used

BCU090	Input Address Not Used	6030.BIN datapoint - BCU_090
(factory setting)	0170	

If necessary, change the value *6030.BIN calibration - CalBCU_090* .

Address BCU091 - Vacant Input Address

Vacant input address

BCU091	Vacant input address	6030.BIN datapoint - BCU_091
Factory setting:	0150	

If necessary, change the value *6030.BIN calibration - CalBCU_091* .

→NOTE:

When the address is accessed, all the digits of the value are displayed only if the first digit is not a zero.

Address BCU092 - Vacant Input Address

Vacant input address

BCU092	Vacant input address	6030.BIN datapoint - BCU_092
Factory setting:	0050	

If necessary, change the value *6030.BIN calibration - CalBCU_092* .

→NOTE:

When the address is accessed, all the digits of the value are displayed only if the first digit is not a zero.

Address BCU093 - Vacant Input Address

Vacant input address

BCU093	Vacant input address	6030.BIN datapoint - BCU_093
Factory setting	0052	

If necessary, change the value *6030.BIN calibration - CalBCU_093* .

→NOTE:

When the address is accessed, all the digits of the value are displayed only if the first digit is not a zero.

Group 20 - Theory of Operation

SyncroPlus Transmission - Theory of Operation, Summary of References

SyncroPlus transmission

- [SyncroPlus Transmission - Theory of Operation, Summary of References](#)
- [SyncroPlus Transmission - Layout](#)
- [SyncroPlus Transmission - Lubrication System](#)
- [SyncroPlus Transmission - Shift Operation](#)
- [SyncroPlus Transmission - Synchronization](#)
- [SyncroPlus Transmission - Operation of Transmission Oil Circuit \(including Diagram\)](#)
- [SyncroPlus Transmission - Transmission Oil Pump](#)

Perma clutch II module

- [SyncroPlus Transmission - Perma Clutch II Module, Exploded View](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Layout](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Power Flow](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Hydraulic Diagram](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Description of Various Valves and Components](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Pressure Regulating and Filter Bypass Valves](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Clutch Pedal Valve and Engagement Override Valve](#)
- [SyncroPlus Transmission - Perma Clutch II Module, Cooling](#)

Gear transmission

- [SyncroPlus Transmission - Gear Transmission, Layout](#)
- [SyncroPlus Transmission - Gear Transmission, Power Flow](#)
- [SyncroPlus Transmission - Gear Transmission, Neutral Start Switch](#)

Range transmission

- [SyncroPlus Transmission - Range Transmission, Layout](#)
- [SyncroPlus Transmission - Range Transmission, Power Flow](#)
- [SyncroPlus Transmission - Range Transmission, Park Lock](#)

Creeper transmission

- [SyncroPlus Transmission - Creeper Transmission, Layout and Theory of Operation](#)
- [SyncroPlus Transmission - Creeper Transmission, Power Flow](#)

The oil that flows through pressure regulating valve (31) to shut-off valve (55) and to the other valves only becomes available after system pressure has been reached. This oil is designated system 2 oil.

When the reverse drive is moved out of neutral position (but no direction of travel is selected yet), the following happens: The PRC control unit receives the corresponding input signal from the neutral switch of the reverse drive lever.

The PRC control unit now sends the corresponding output signal to transmission enable solenoid valve (57). Transmission enable solenoid valve (57) allows system 1 oil to flow to forward solenoid valve (59) and reverse solenoid valve (58). It also allows system 1 oil (pilot oil) to flow to shut-off valve (55).

Only now can system 2 oil flow via shut-off valve (55) to modulator valve (25), clutch pedal valve (21) and via engagement override valve (17), which is already activated, to forward/reverse valve (12).

System 2 oil (pilot oil) flows to the backside of clutch pedal valve (21) and to the backside of modulator valve (25) and pushes the modulation valve to its center position.

→NOTE:

The force of the spring of the modulator valve corresponds to a pilot oil pressure of approx. 200 kPa (2 bar; 29 psi). This ensures that the modulator valve moves back from sump position to center position when system 2 oil pressure drops below 200 kPa (2 bar; 29 psi).

When, with the reverse drive lever coming from neutral position, a direction of travel is selected, the PRC control unit receives the corresponding input signal from the reverse drive lever. The PRC control unit now sends the corresponding output signal to forward solenoid valve (59) or reverse solenoid valve (58).

When forward solenoid valve (59) or reverse solenoid valve (58) is activated, system 1 oil flows to forward/reverse valve (12). Forward/reverse valve (12) switches from neutral to the selected direction and the sump passage is closed. Thus pressure builds up and closes sump valve (16); accumulator piston (19) is charged and modulator valve (25) opened. Now, system 2 oil flows to the disk clutch or to the disk brake.

At the same time, cooling oil flows to the disk clutch or to the disk brake via cooling control valve (14). However, cooling only takes place during the slip phase within a pressure range of 250 kPa (2,5 bar; 36 psi) to 950 kPa (9,5 bar; 140 psi). This is controlled by cooling oil valve (29) and cooling oil pilot valve (24).

→NOTE:

For additional description on the theory of operation, see Section 251 at:

[PowrReverser Transmission - PowrReverser Module, Description of the Individual Valves and Components](#)

[PowrReverser Transmission - PowrReverser Module, Operation of the Pressure Regulating and Filter Bypass Valves](#)

[PowrReverser Transmission - PowrReverser Module, Operation of the Forward/Reverse Modulation](#)

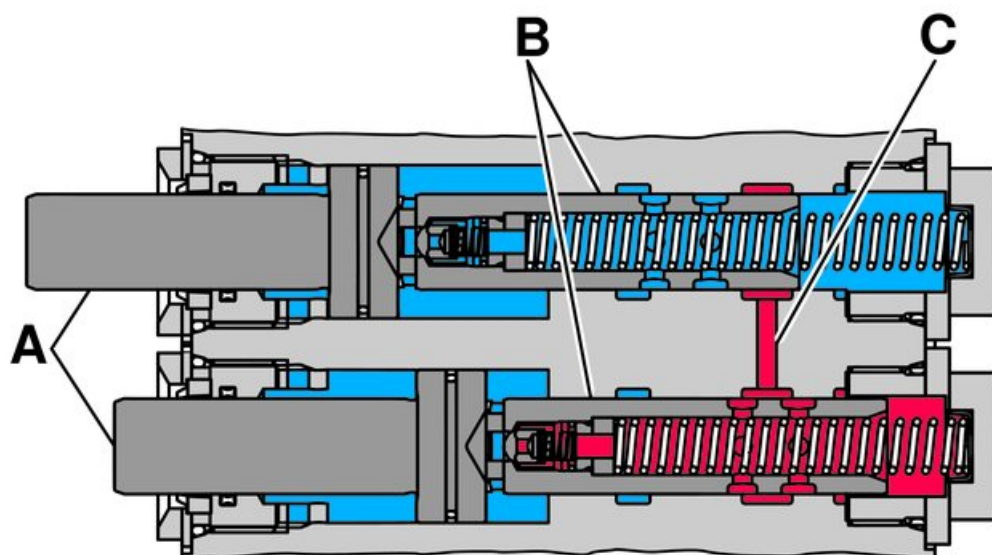
[PowrReverser Transmission - PowrReverser Module, Operation of the Clutch Pedal Valve](#)

[PowrReverser Transmission - PowrReverser Module, Operation of the Engagement Override Valve](#)

[PowrReverser Transmission - PowrReverser Module, Operation of the Cooling System](#)

LEGEND:

1	Planetary gear housing
2	Overspeed relief valve, forward clutch
3	Forward clutch
4	Forward clutch module lube
5	Front transmission cover
6	Cooling oil control valve (forward clutch)
7	Clutch cooling valve
8	Cooling oil control valve (reverse brake)
9	Reverse brake module lube
10	Reverse brake
11	Reverse brake housing
12	Gear-to-gear modulator valve
13	Accumulator, gear-to-gear modulation
14	Return valve, gear-to-gear modulation
15	Pressure switch, system pressure
16	Pressure-regulating valve
17	Cooler relief valve
18	Lube oil relief valve
19	Front valve housing
20	Oil cooler
21	High return
22	Reverse solenoid valve (Y36)
23	Reverse shift valve
24	Forward solenoid valve (Y33)
25	Forward shift valve
26	Enable proportional solenoid valve (Y38)
27	Transmission oil filter bypass valve
28	Pressure switch, transmission oil filter restriction
29	Transmission oil filter housing
30	Transmission oil filter
31	Transmission oil pump
32	Temperature sensor
33	Inlet screen
34	K1 solenoid valve (Y40)
35	B1-B2 shift valve
36	K2 solenoid valve (Y39)
37	B2-B3 shift valve
38	B3-C4 shift valve
39	Module lube
40	Shift valve housing
41	C4 clutch
42	Anti-cavitation check valve, C4 clutch
43	B2-B3 brake housing
44	B2 brake
45	B3 brake
46	B1 brake housing
47	B1 brake
48	Mid-return
49	Enable pressure switch
50	Suction valve, forward clutch
51	Suction valve, C4 clutch
52	Test port for forward clutch
53	Test port for forward clutch cooling
54	Test port for reverse clutch cooling
55	Test port for reverse brake
56	Test port for B1 brake
57	Test port for B2 brake
58	Test port for B3 brake
59	Test port for C4 clutch
60	Test port for lube pressure
61	Test port for system pressure

**LX1041561****Figure 2**

See Figure 1: This shows how hole (C) enables pressure to be equalized between the right and left pistons when the two pedals are pressed together.

See Figure 2: If the steering brake is actuated when working in the field, only one brake piston moves forward and develops pressure. In this case, it is not desirable for pressure to be equalized and this is prevented by hole (C) remaining closed as the other piston does not move from its neutral position.

PFC Hydraulic System - Priority Circuit 1, Hydraulic Diagram and Theory of Operation

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→NOTE:

The illustration shows the detent function in the extend cylinder position.

When detent function (A) is selected, the valve spool and control lever are held by hydraulic detent (O) in the extend cylinder or retract cylinder positions until a certain load pressure has developed in connecting passages (S) or (T).

In this detent function, hydraulic detent (O) is also activated (as described under detent function 1). In addition, load pressure oil can pass via control valve (Q) to pressure-limiting valve (R). When a certain load pressure has developed at the pressure limiting valve, it opens and allows the load pressure oil to reach control valve (J). Control valve (J) is forced against spring pressure to the left and down, and connects oil chamber (I) under annular piston (K) with relief passage (V), which leads to the reservoir (differential housing). This deactivates hydraulic detent (O) and the spool/control lever is automatically returned to neutral by centering spring (C).

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